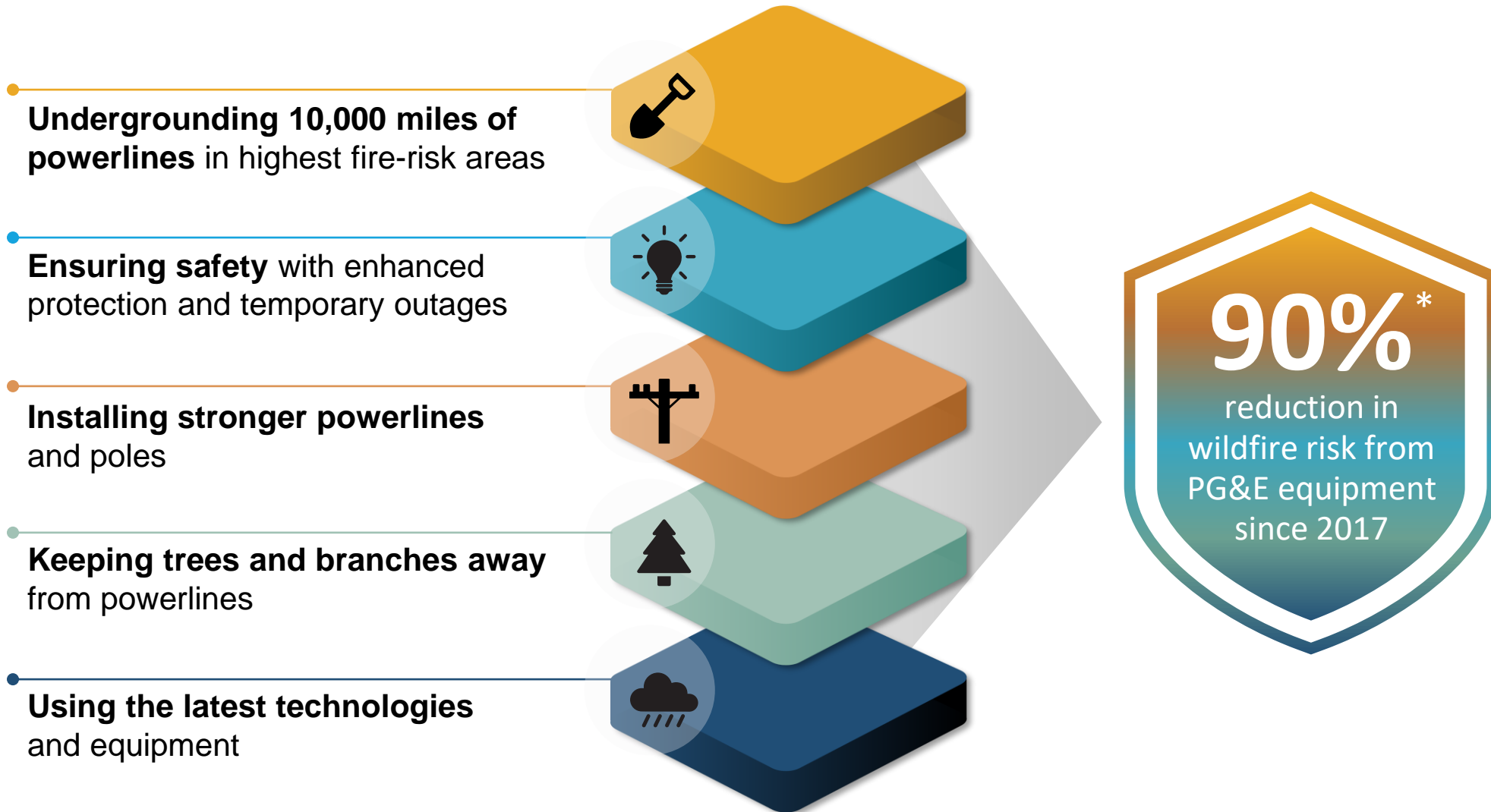


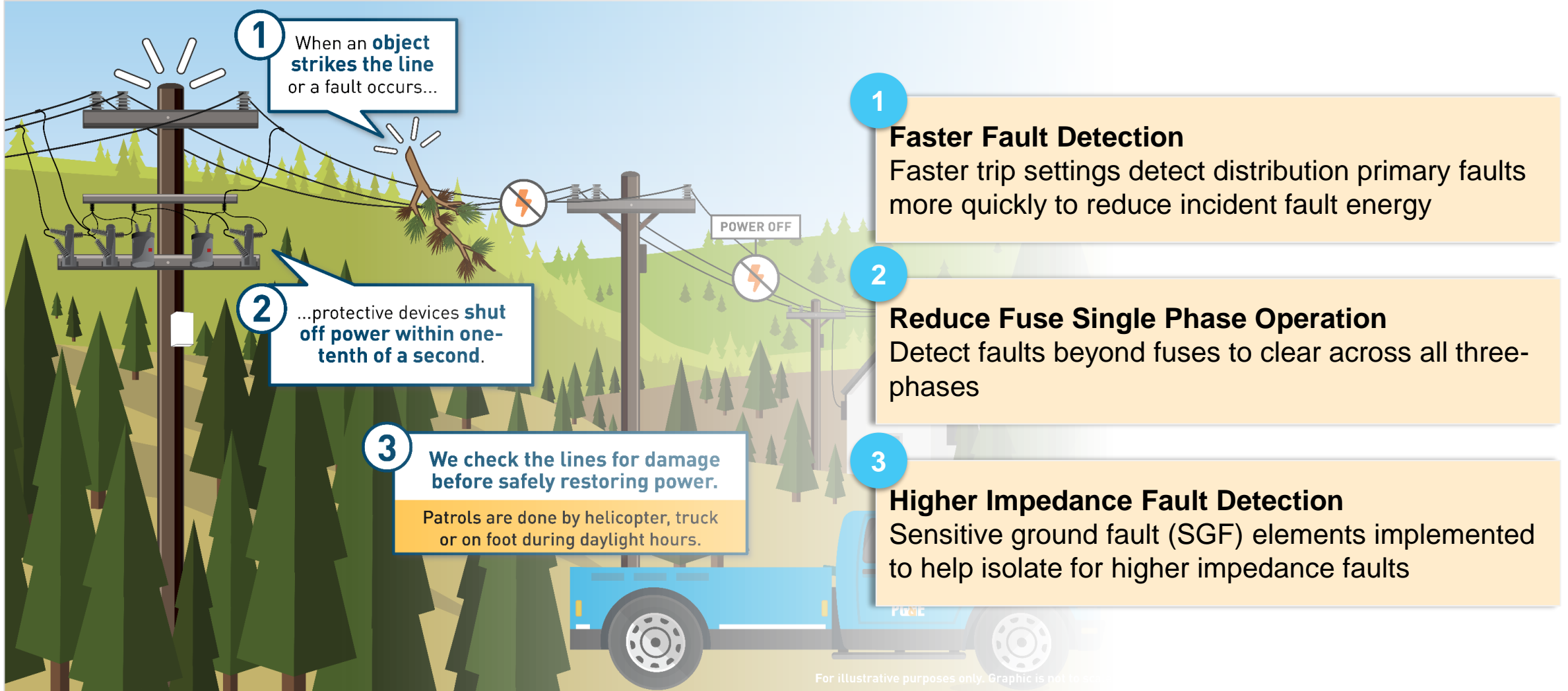
Pacific Gas & Electric Company
2023 Enhanced Powerline Safety Settings (EPSS)

Layers of Protection



1. This number was calculated using the potential safety, reliability and financial impacts of wildfires and their expected frequency, as established by the California Public Utilities Commission.

What Are Enhanced Powerline Safety Settings?

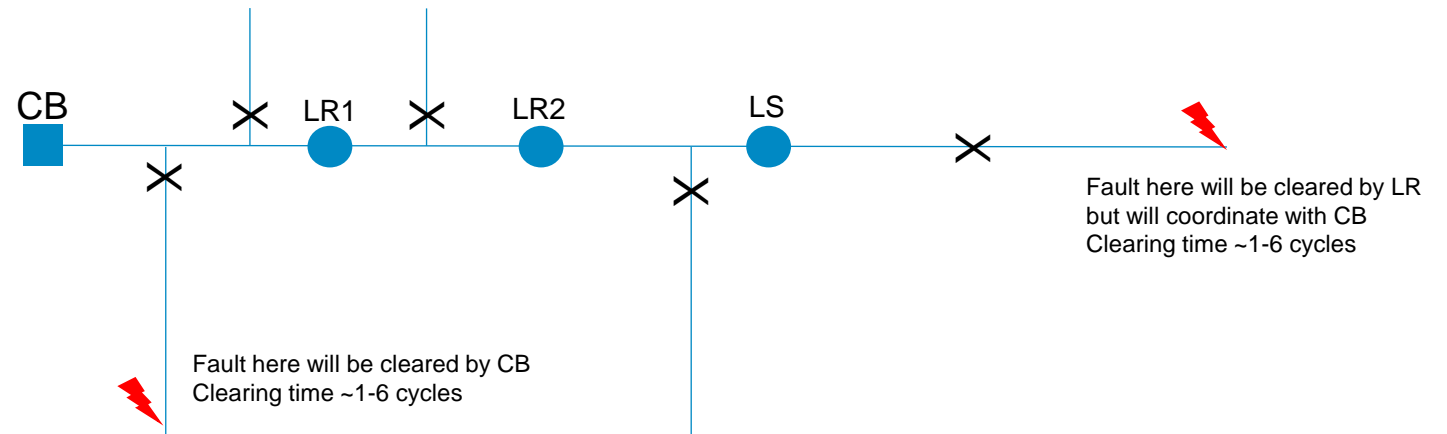


EPSS Protection High Level

	Objective	Method
I	Faster Fault Detection and Clearing	The new settings provide a goal of detecting distribution primary faults in 0.1s or less (6 cycles) in order to reduce incident fault energy. Include +1.2 to +3 cycle time delay between LR/CBs, optimizing for greater coordination margin where possible to help achieve coordination and thereby reduce patrol zone.
II	Reduce Fuse Single Phase Operation	Circuit breakers and reclosers setup to detect faults beyond fuses to clear with ganged three-phase protection in order to attempt to prevent 1/2 of 2 or 3 fuse blown*. <i>Load & Fuse Link Type permitting</i>
III	Higher Impedance Fault Detection (SEF)	On most 3-wire circuits, sensitive earth fault (SEF) elements will be implemented to help isolate for higher impedance faults. 15A @ 15 sec (+3 sec each upstream LR/CB). <i>Year-round setting</i>

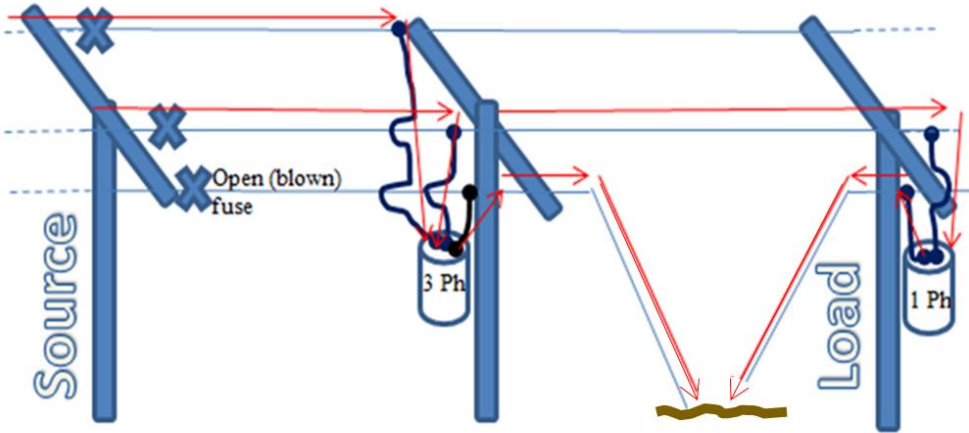
* For high energy faults (closer to source) and faults beyond current limiting fuses (FT, ELF) there is potential for fuse to melt before CB/LR trips. In this case, there will still be risk with 1/2 of 3 fuse blown scenario. Additional devices and reconfiguration of fuse could reduce this risk.

1. A short definite time delay will be applied to reclosers while respecting the design goal of less than 0.1s total clearing time for bolted fault conditions at the CB. This will provide a level of coordination between reclosers and circuit breakers that will help eliminate multiple LR/CB zone patrols in many cases
2. Faults beyond fuses can be detected and isolated by reclosers or CBs (ganged) thereby requiring full patrol of fuse laterals for a CB or LR lockout
3. Switch (SW) or Sectionalizer (LS) Mode Devices will not constitute a patrol boundary. Trip Savers to be treated as fuses. Fuse Savers treated as LR. Fuse Savers will use the inherent 'Fast Single' mode. Interrupters not used due to lack of group settings change options.
4. Scheme settings will be provided in SCADA control groups for most device types to be able to engage schemes as needed



EPSS Protection High Level

Why set protection to look past fuses and trip savers?



- Backfeed due to single phase fuse operation can cause high impedance fault.
- Not all cases can be cleared with upstream protection, but high percentage can.
- Some fuse link types (current limiting) can contribute to more uncleared/high impedance faults under this condition

Future usage of AMI coupled with force out could solve gap where EPSS is not effective

